The Trace of Sociability in Web Accessibility Technologies

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Abstract. *This position paper presents WNH, a Web Navigation Helper for users with special needs, and reports an empirical study where we found that sociability models may be invisibly encoded in accessibility tools like WNH. Our position is that the scientific foundations of CS may make it difficult for computer scientists to realize and deal with the cultural determination of technologies they help create.*

Resumo. *Este artigo-posição apresenta o WNH, um assistente de navegação para a Web destinado a usuários com necessidades especiais. Reporta um estudo empírico através do qual descobrimos que modelos de sociabilidade podem estar invisivelmente codificados em tecnologias para acessibilidade tais como o WNH. Nossa posição é a de que os fundamentos científicos da Computação podem dificultar aos cientistas enxergar e lidar com a determinação cultural das tecnologias que ajudam a criar .*

1. Introduction

Web accessibility is nowadays one of the big challenges for both ICT and society. It is more than a matter of technical complexity, like producing the right devices and programs for people with special needs to be able to navigate on the Internet. Web accessibility is also a matter of social complexity, like devising the appropriate legislation to protect the users' and developers' rights and responsibilities now that social relations take place in virtual domains and redefine what we know as *the real world*. Hiding behind what seems to be an intriticate mesh of socio-technical issues is, in fact, a scientific challenge, which Computer Science in only beginning to address. CS must now accommodate at the very heart of its foundations the ontological and methodological expansions required for generating valid knowledge about a new object of investigation, a human-computer hybrid, the Web.

In this position paper we briefly discuss a very specific issue in Web accessibility, with reference to our ongoing research with WNH, the *Web Navigation Helper*. This is a user agent we have modeled and developed (Intrator and de Souza, 2009; de Souza, Monteiro and Intrator, 2010). We propose that most of the current research efforts to produce enabling Web navigation technologies implicitly or explicitly adopt a networked society perspective (Castells, 2001). This is not only detrimental to other sociability models that are still in place in many cultures, but also ignores the fact that certain face-to-face sociability ingredients, if transposed to online environments, may eventually play a key role in helping these users become part of a new social order.

Our research is founded in Semiotic Engineering (de Souza, 2005b). This is a semiotic theory of human-computer interaction whose distinctive feature, compared to other theories of HCI, is to state that system designers (*i. e*. the team that conceptualizes what a computer system is, what human activities it supports or affects, in which contexts, and how) actually *communicate with users* at interaction time (de Souza, 2005a). The system's interface *represents the designers*, and achieve all and only the conversational paths encoded in the system at development time. Even when interfaces take a very reified shape, which doesn't even remotely resemble the humans that are actually speaking to users through various kinds of interface controls, the interactionthat interfaces support is basically that between human minds.

This perspective allows us to trace human values and attitudes in technology with greater clarity than other perspectives that are centered exclusively on users. It also allows systems designers to view themselves as *having something to say* through software, which raises a whole range of new issues in HCI research, and connects to the sociability issues that we want to discuss.

Although the discussion is very specific to a particular context that we have explored in our research, we believe that it points to certain aspects of Web Science that are not often formulated as in this paper. This is thus our proposed contribution to the First Workshop of the Brazilian Institute for Web Science Research.

2. The Web Navigation Helper – WNH

WNH is a plug-in to Firefox that works in conjunction with CoScripter, a macro recorder for the Web (Leshed et al., 2008). The basic operation starts with the creation of a CoScripter macro that automates a particular web task. CoScripter macros can be shared when variables are introduced in lieu of specific recorded instance values. Let us suppose that frequent visitors of a small local library web site repeatedly perform the following steps when trying to find out if the book they want to read is available:

* go to www.my-little-library.org
* **enter BOOK TITLE into the "Book you are looking for" textbox**
* click the "Find" button
* **select the BOOK TITLE from the listbox**
* click the "Check Availability" button

"BOOK TITLE" stands for a variable that is instantiated differently on different occasions when the user is navigating the site (*e.g.* "Wuthering Heights" on one day, "Pride and Prejudice" on the other, and so on)[1]. The underlined instructions highlight instructions where the user must input *information* (*e. g.* "Book title"). Actions can be executed by CoScripter without prompting the user. Input can only be automatically filled in by CoScripter during script execution if there is an explicit association between variable name and value in the user's personal database (a CoScripter file). Otherwise, script execution is halted until the user provides, interactively, the necessary information for the script to continue executing.

[1] These steps might be instructions in a CoScripter macro, except that CoScripter variables are not represented in capitals – they are preceded by the CoScripter keyword "your".

By feeding web pages with previously recorded user input, CoScripter *automates* frequently performed web navigation, and *accelerates* interaction to achieve the corresponding goal. WNH, however, *mediates* scripted interaction with the web site, by having a separate dialog with the user. The necessary input to trigger script execution can be asked in a style that is specially designed to meet the user's assistive needs. For example, the WNH conversation with a first-time adult user of the small local library web site, with low level of digital literacy, might go on like sketched in Figure 1.

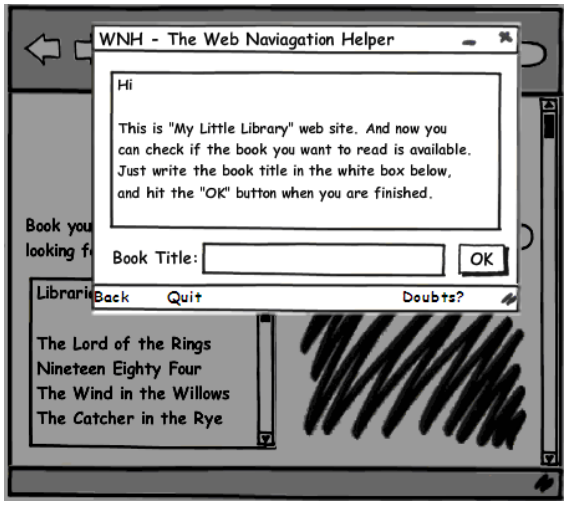

Figure 1: A sketch of how WNH mediates web navigation

Through dialogs like the one shown in Figure 1, the user can be spared the challenge of dealing with multiple independent interaction choices typically found in web pages, and concentrate on a single thread of conversation to achieve his or her goal (*e. g.* checking if a particular book is available in the local library).

Mediating dialogs can be created for most web sites, and be so designed that they meet the needs of targeted user profiles like visually impaired users, users with motor and cognitive disabilities, functionally illiterate users, elderly users and even users that simply find it difficult to navigate the web. As long as there are scripts representing a sequence of steps to achieve various kinds of goals on the Web, and that these scripts can be executed with input provided by users in dialogs with WNH, there may be indefinitely many styles and forms of conversations to help users do what the scripts do.

Our initial vision was that WNH dialogs would be created by a community of volunteers, who have no difficulty to navigate the web, can understand how web macros work, have a high level of general empathy with people that need assistance, and are able to use a specialized editor to write the mediating dialogs for CoScripter macros. This community should be supported with tools like specialized dialog editors, designed by accessibility and usability experts.

3. The Semiotic Engineering Perspective in Action

Semiotic Engineering (de Souza, 2005b) differentiates the role of *humans* in *human-computer* interaction. Instead of focusing exclusively on (human) users, this theory

focuses on communication between users and designers of computer technologies. In other words, Semiotic Engineering seeks to relate, explicitly, the human experience of *using* technology with that of *producing* it. This is a gap never really bridged by HCI theories to-date, which makes Semiotic Engineering an interesting candidate for expanding knowledge in its field.

The main concept in Semiotic Engineering, is *metacommunication* – communication about communication. HCI is viewed as a metacommunication bringing together designers and users at interaction time (de Souza, 2005a). As user and system exchange input and output messages, systems interfaces *tell* users the designers' intent and vision. They let the users know (explicitly or implicitly) who are the users that the designers had in mind, what needs and expectations they learned (or believe) the users have, and why. Interfaces also tell users what the designers learned (or believe) the users want to do, and how. Therefore, system interfaces actually express the designers' *vision* and, through carefully engineered interactive protocols (*i. e.* virtual conversations), achieve communication about how to communicate with the system in order to create various kinds of effects and meet various kinds of goals that are in line with the design vision.

Figure 2: Google's main user interface

For a very brief illustrative example of the main idea, let us examine Google's main page. (Figure 2). The designers' metacommunication message is telling users a number of things. For example, the designers are communicating that they think the users don't want to go into long query-specifying dialogs. They say it by providing only a single textbox for input and requiring only one click to trigger the search. Designers also communicate their playful attitude through the "I'm feeling lucky" button, which actually invites users to "play the game" that the designers propose. This particular instance of semiotic engineering is an eloquent example of the technology producers' desire to make contact with users through the interface they provide. Another example of intentful communication is the presence of the "Go to Google Brasil" link at the bottom of the page, *telling* the user that "Google" (*i. e.* those who designed and developed it) can guess that the user is located in Brasil, and may wish to use the customized interface that was designed and developed for *Brazilian* users.

Users, of course, react to this communication, instinctively tracing the presence of a human mind somewhere within a computer system. Previous studies in human-computer communication, for instance, discuss the apparent paradox of savvy computer users anthropomorphizing computers even if they are completely aware that computer programs do not have a *homunculus* inside them (Reeves and Nass, 1996; Sundar and

Nass, 2000). More recent research, however, fully acknowledges the computer-mediated communication process between users and developers supported by interactive systems (Fogg, 2003; Light, 2004).

WNH is a radical appropriation of the notion that *designers/developers* can talk to *users* at interaction time. On the one hand, the very idea of transforming original Web interaction into something else – that is, capturing designed dialogs and translating them into another style of interaction that specific users can understand more easily – is a tacit acknowledgment that software can be viewed as communication among and humans. On the other, in order to *translate* communication into a more adequate style of communication, a number of requirements must be met, like:

- knowing the targeted user's comunicative abilities and preferences;
- knowing the targeted user's language(s);
- knowing how to cast the user's linguistic competence into interactive patterns generated and presented by a computer program with finite interface vocabulary;
- knowing how to translate arbitrary Web interactions into mediating interface dialogs that meet the targeted user's communicative abilities and preferences; and so on.

The items above, given the overall context of WNH, suggest that for volunteers to generate good mediating dialogs to help users with special needs in the Internet, they should perform a kind of "end user semiotic (re)engineering" of interactions to achieve scriptable Web tasks in which these users are interested. So, the tools that must be developed for supporting volunteers are semiotic engineering tools for end users with advanced levels of computer literacy.

4. An Empirical Study with Potential WNH Volunteers in Brazil

In April 2010 we carried out a study with participants that viewed themselves as potential WNH volunteers. We adopted a qualitative methodology, worked with a small sampling, and after an in-depth analyses of collected evidence we extracted rich interpretations of a wide range of questions involved in the observed phenomenon. In this section we will only provide a brief description of the activities we carried out with participants to collect our data, and indicate a small sub-set of results directly connected with the topic of this paper.

We worked with eight non-expert but experienced Internet users, all well trained Language students, taking a course in digital narratives and related topics (HCI and Accessibility *excluded*). Our specific goal was to get information about how WNH Support should be designed in order to effectively help WNH volunteers make it easier for users with special needs to navigate the web guided by CoScripter macros.

The task each participant had to achieve was to create mediating dialogs for running a previously created script. They worked with a template for dialogs, where certain standard layout and control elements were shown. The sketched dialog in Figure 1 is an instance of the template. Participants could write their own text and use their own input and control elements on the upper part of the dialog. However, they could not change the navigational links at the bottom ("Back", "Quit", "Doubts?"). They could use the "Doubts?" link, for instance, to provide additional information about WNH, or

about the Web application that they were helping users interact with, or about the user's operating system, and so on. The targeted WNH end user population they should have in mind in this experiment was that of elderly people interested in using the Internet.

The group listened to a brief oral presentation about CoScripter and WNH. During the presentation, we explicitly mentioned the special needs of elderly people, and provided a printed list of guidelines and facts about elderly user interactions with computers. Participants were then asked to to fill out paper prototype "WNH forms" to compose mediating dialogs for running the script shown in Figure 3. The role they should play in the test scenario was that of a teacher of an Internet class for a group of elderly learners. She wanted to write a special WNH dialog to help her students create an email account in *Yahoo!*.

1. go to "http://www.yahoo.com/"
2. click the "Yahoo! Mail" link
3. click the "Sign Up" link
4. enter your "FIRST NAME" into the "firstname" textbox
5. enter your "LAST NAME" into the "secondname" textbox
6. select your "GENDER" from the Gender listbox
7. select your "MONTH" from the "Date of Birth" listbox
8. enter your "DAY" into the "Day" textbox
9. enter your "YEAR" into the "Year" textbox
10. enter your "LOGIN" into the "Yahoo! ID and Email" textbox
11. enter your "PASSWORD" into the "Password" textbox
12. enter your "PASSWORD" into the "Re-type Password" textbox

Figure 3: Script for creating an email account

Because this group had no technical knowledge, we provided them with a little glossary of interface element names, like "textbox", "radio button", "checkbox", and the like. WNH forms also offered multiple choices of input elements for participants to select when designing input interaction for the dialogs. Given the experiment time limits, only half of the participants reached the last part of the script (steps 9 to 12). Actually, it was not necessary that participants finished all the dialogs for all script input instructions. The richness of interaction and the communicative challenges evidenced in the dialogs that were created for parts of the script already provided valid insights on the kinds of difficulties that non-technical WNH volunteers would probably have.

Five of the eight participants understood how CoScripter and WNH worked together. The others were confused when they had to indicate where their dialogs should be inserted in the set of CoScripter instructions. There was also confusion about how script execution was done. For example, they created a dialog for the first three lines of the script, where no user input data was necessary. The effect of mediation in this case was stepping through the instructions instead of running through them automatically until the next input data was needed.

To our surprise, most participants did not check the list of guidelines and information about elderly users' needs and characteristics with respect to using computers. They did not seem inclined to learn about a *user population* in general, and preferred to use their personal knowledge of what elderly people need, with occasional references to the information we geve them during our presentation.

Regarding the content and style of dialogs, all the participants provided detailed explanations about how to use interface controls. They embedded useful information and tips in a number of dialogs, such as the 'login' and 'password' request dialog, for instance. However, in the process, some participants 'guessed' or 'invented' explanations that were not provided or backed up by the web site. For example, one participant explained that *Yahoo!* asked users to inform their date of birth because they were concerned that people under 18 years of age would create email accounts of their own. This clearly pointed to the risk of spreading misconceptions and false information with WNH scripts.

After the test, we had 15 minutes of group discussions about the experiment, where a number of interesting contributions were made. Some of the participants manifested their difficulty in explaining the basics of interaction. One participant said that he was worried that the language and style he used would not sound childish to the elderly. Another one mentioned that the experiment made him think of his teaching activity. So, he followed a tutorial style, and thought this strategy helped him accomplish the task.

One participant declared that he was rather pessimistic about Brazilians engaging in this sort of social volunteering online. He did not see people helping other people *at large*. This statement started a lively discussion about certain conditions under which Brazilians were likely to help others, rather than be selfish. There was a consensus in the group that everybody in this culture would be happy to help their grandmother and grandfather, or some other elderly person *they knew well*. As one participant put it, she would rather not talk to "the rest of world". In the end, although some other participants were also pessimistic about Brazilians engaging in social volunteering activities for the benefit of "the public in general", they all agreed that if they developed a script for somebody they knew, they would be happy to share it with people that their friends and family knew, if asked to do so on a personal basis.

5. Concluding Remarks

Our first vision of WNH was different even from assistive technologies and user agents that take CoScripter or web scripts as a basis. Unlike Trailblazer (Bigham et al., 2009), a CoScripter-based system that infers and suggests next steps of navigation for visually impaired users, or HearSay3 (Borodin et al., 2008), another system that uses macros to facilitate navigation for the blind and accepts voice commands, our idea was not to support generic web navigation for challenged users. The idea was that WNH would foster the development of a community of volunteers (Intrator and de Souza, 2009), which would promote and sustain continually the creation of accessibility-oriented Web goal-specific scripts for another community of people (users with special needs). This alternative was repeatedly contested by discussants of our work, who said that the approach did not *scale up* to meet the tremendously wide variety of tasks that a very large population of users with restricted access to the Web should be able to achieve.

Discussants seemed to have a networked sociability model in mind, where individuals play multiple social roles, belong to multiple groups, experience constant mobility, develop multiple *identities*. In this context, indeed, social engagement only made sense if people could navigate through multiple spaces, rather than be trapped in the context of specific scripted activities. So, we struggled to find a way to *scale up* script and mediation dialog production, which often pointed in the uncomfortable direction that human scripters and dialog writers should be taken out of the loop.

However, as one participant in our study remarked, causing an immediate and emotional reaction from other participants, Brazilian sociability is still considerably influenced by a different sociability model, a community model. In communities, individuals experience strong personal relations and intimacy. An individual's identity is built and sustained by such relations and collective values. "Others" are not totally unknown, faceless individuals. They can always be chartered in a space of inter-personal relations, because of their relations with other people one personally knows.

So, we revised our design and concluded that the very diverse approach we took to WNH compared to contemporary technologies that aim to achieve the same goal was in fact a reminiscence of Brazilian culture. Human mediation in the process of generating accessibility scripts actually opens the door to another style of social participation and contribution. Rather than generating scripts for users *at large*, our technology is actually better fit for end users that want to help family members, friends, and people they can 'get in touch with'. And because this is so, they can have control of the impact of occasional flaws in their scripts, provide face-to-face explanations, etc. Rights and responsibilities for producing technologies that others will use can be negotiated on a personal basis.

This small lesson is an icon of a larger picture, which may be relevant for thinking about the Web and how technologies are shaping society. Generality and universal principles, so dear to computer professionals and valued by computer scientists that seek to solve problems with algorithms, may in some cases come at the expense of cultural practices that must not necessarily give in. Our research in Semiotic Engineering suggests that, perhaps, this theory can bridge one of the many gaps separating mathematical abstractions from human meanings, and bring culture closer to the heart of Computer Science. If programs can be seen as pieces of human communication and expression, then we may begin to expand CS ontologies in the direction of society.

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